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First record of *Juliomys ossitenuis* Costa, Pavan, Leite & Fagundes, 2007 (Rodentia, Sigmodontinae) in Paraná state, southern Brazil

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Abstract: *Juliomys ossitenuis* was previously known from the Atlantic Forest of southeastern Brazil, where it occurs in Dense Ombrophilous Forest. The record of the species in Floresta Nacional de Piraí do Sul, in Paraná state, confirmed by morphological and cytogenetic analyses, extends its distribution about 200 km southwards. This is the first record of the species in the state and in an area of Mixed Ombrophilous Forest (Araucaria Forest).

Key words: small mammals, Araucaria Forest, distribution extension

Juliomys is a genus of sigmodontine rodent characterized by its small size (total length [TL] between 165–238 mm; tail length [TA] between 89–138 mm), tail the same length as or longer than the body length, brown coloration on the dorsum, grayish on the shoulders and anterior portion, orangish on the posterior portion of the dorsum and snout — with the exception of *J. rimofrons* whose snout has the same color as the dorsum (Oliveira and Bonvicino 2002; Pavan and Leite 2011) — and small feet covered by orangish-brown hairs (Bonvicino et al. 2008). The genus was described by González (2000) to account for the morphological differences between *Wilfredomys oenax* Thomas, 1928 and *W. pictipes* Osgood, 1933, with *Juliomys pictipes* designated as the type species of the new genus.

Two additional species have been described over the last decade: *J. rimofrons* Oliveira and Bonvicino (2002), whose type locality is at Serra da Mantiqueira, Itamonte, Minas Gerais (22°21′ S, 044°44′ W, 2,000 m above sea level [a.s.l.]), and *J. ossitenuis* Costa et al. (2007), whose type locality is at Fazenda Neblina, Serra do Brigadeiro State Park, Minas Gerais (20°43′ S, 042°29′ W, 1,300 m a.s.l.). At present, the three species have a known distribution restricted to Dense Ombrophilous Forest, a phytophysiognomy of Atlantic Forest biome, in southeastern (Aguieiras et al. 2013; Fonseca et al. 2013) and southern Brazil (Cerboncini et al. 2014). *Juliomys pictipes* is also known to occur in Argentina (Pardiñas et al. 2008) and Paraguay (De la Sancha et al. 2009). Moreover, *Juliomys ossitenuis* and *J. pictipes* are sympatric at four known localities: Reserva Florestal do Morro Grande, Mulheres and Museros in São Paulo state; and Parque Nacional da Serra dos Órgãos, in Rio de Janeiro state (Table 1).

The three species of *Juliomys* can be distinguished by external morphology and cranial characters. For example, *J. pictipes* is larger than *J. ossitenuis* (TL: 170–238 mm versus 165–213 mm; TA: 92–138 mm versus 89–116 mm), *J. rimofrons* lacks the orangish coloration on the snout and has denser, longer, darker hairs; *J. ossitenuis* has a smaller, more delicate cranium, very similar to that of *J. rimofrons*, but *J. ossitenuis* has smaller posterolateral palatine pits and a more delicate mandible when compared to *J. rimofrons* (Costa *et al.* 2007). However, the most reliable method of identifying species in the genus is via cytogenetics, since *J. pictipes* has a 2n = 36 and FNa = 34 karyotype (Bonvicino and Otazu 1999), *J. rimofrons* has 2n = 20 and FNa = 34 (Oliveira and Bonvicino 2002), and *J. ossitenuis* has 2n = 20 and FNa = 36 (Costa et al. 2007). Futhermore, Paresque et al. (2009) described a new karyotype with 2n = 32 and FNa = 48 in three specimens of Parque Nacional dos Aparados da Serra, Rio Grande do Sul state, a high-altitude area in the Atlantic forest of southern Brazil, with the possibility of a new species for the genus.

The geographic distribution of *J. ossitenuis* was cited by Costa et al. (2007) and later updated and mapped by Pavan and Leite (2011) and Aguieiras et al. (2013). The known localities for the species are presented in Table 1 and Figure 2. Until this new record, *J. ossitenuis* was known only from the Atlantic Forest (the Dense Ombrophilous Forest vegetation type) in all the states of southeastern Brazil: São Paulo, Rio de Janeiro, Minas Gerais and Espírito Santo. This article reports the first record of the species in Paraná state, southern Brazil, and in a new vegetation type, the Mixed Ombrophilous Forest (Araucaria Forest).

We recorded *Juliomys ossitenuis* (Figure 1) in Floresta Nacional de Piraí do Sul (24°34′40″ S, 045°09′00″ W, 900 m a.s.l.), a sustainable use protected area located 6 km south from the town of Piraí do Sul and 190 km northwest from

Table 1. State, municipality, locality and coordinates where *Juliomys ossitenuis* was previously known ([1] Costa et al. 2007; [2] Pavan and Leite 2011; [3]Aguieiras et al. 2013).

State	Municipality	Locality	Latitude	Longitude
Espírito Santo	Dores do Rio Preto	Casa Queimada, Parque Nacional do Caparaó[1]	20°46′ S	041°81′ W
Espírito Santo	Dores do Rio Preto	Macieira, Parque Nacional do Caparaó[1]	20°48′ S	041°83′ W
Espírito Santo	Castelo	Parque Estadual do Forno Grande[2]	20°52′ S	041°00′ W
Minas Gerais	Fervedouro	Fazenda Neblina, Parque Estadual da Serra do Brigadeiro[1]	20°72′ S	042°48′ W
Minas Gerais	Passa Quatro	Fazenda do Itagué[1]	22°47′ S	045°08′ W
São Paulo	Bananal	Estação Ecológica do Bananal[1]	22°80′ S	044°37′ W
São Paulo	Cotia	Sítio Até Que Enfim[1]	23°68′ S	047°03′ W
São Paulo	Cotia	Quilombo, Reserva Florestal do Morro Grande[1]	23°76′ S	047°00′ W
São Paulo	Cotia	Grilos, Reserva Florestal do Morro Grande [1]	23°78′ S	047°01′ W
São Paulo	Piedade	Cristo[1]	23°85′ S	047°47′ W
São Paulo	Piedade	Fragmento Eme[1]	23°88′ S	047°48′ W
São Paulo	Tapiraí	Fragmento Antenor[1]	23°92′ S	047°45′ W
São Paulo	Tapiraí	Janzinho[1]	23°97′ S	047°51′ W
São Paulo	Ribeirão Grande	Mulheres[1]	24°05′ S	048°37′ W
São Paulo	Ribeirão Grande	Museros[1]	24°22′ S	048°40′ W
São Paulo	Ribeirão Grande	Mina Limeira[1]	24°17′ S	048°33′ W
Rio de Janeiro	Teresópolis	Abrigo Paquerer, Parque Nacional da Serra dos Órgãos[3]	22°27′ S	042°59′ W
Rio de Janeiro	Teresópolis	Rancho Frio, Parque Nacional da Serra dos Órgãos[3]	22°27′ S	043°00′ W

Curitiba, in Paraná state. The protected area is located on the First Paraná Plateau, a natural subzone of the Maracanã Plateau (Maack 2012), near the division between the First and Second Paraná Plateaus, in the east-central region of the state (Figure 2). The Floresta Nacional de Piraí do Sul is about 153 ha, of which 7.2 ha have been reforested with *Araucaria angustifolia* and *Ocotea porosa*, and 39 ha with *Pinus elliotti* and *P. taeda* planted in the 1970s and 1980s. An additional 13 ha are occupied by firebreaks, and the remaining ~93 ha are native Araucaria Forest in different stages of succession. The landscape surrounding the protected area is dominated by large-scale intensive agriculture, pastures, and monoculture *Pinus* plantations. The climate can be classified as temperate mesothermal subtropical (Cfb), according to the Köppen-Geiger's classification (Kottek et al. 2006). This climate has mild summers, uniformly distributed rainfall, no dry season and the average temperature of the warmest month does not arrive at 22°C. The annual pluviosity is between 1,100–2,000 mm. Soils are primarily classified as a type known in Brazil as "Latossolo bruno" and elevation varies from 900–1,248 m a.s.l.

An age class 2 (following Costa et al. 2007) male specimen of *Juliomys ossitenuis* was captured on 24 November 2012 (ICMBio Permit No. 35534-1, issued 30 August 2012) in a linear transect of pitfall traps, with four 60 L buckets connected by black canvas drift fence, set in riparian forest along a river measuring ~2 m wide (Figure 3). The sampling

Figure 1. An adult, male, *Juliomys ossitenuis* (MHNCI 6478) from Floresta Nacional de Piraí do Sul, Paraná, Brazil. Photograph by Guilherme Grazzini.

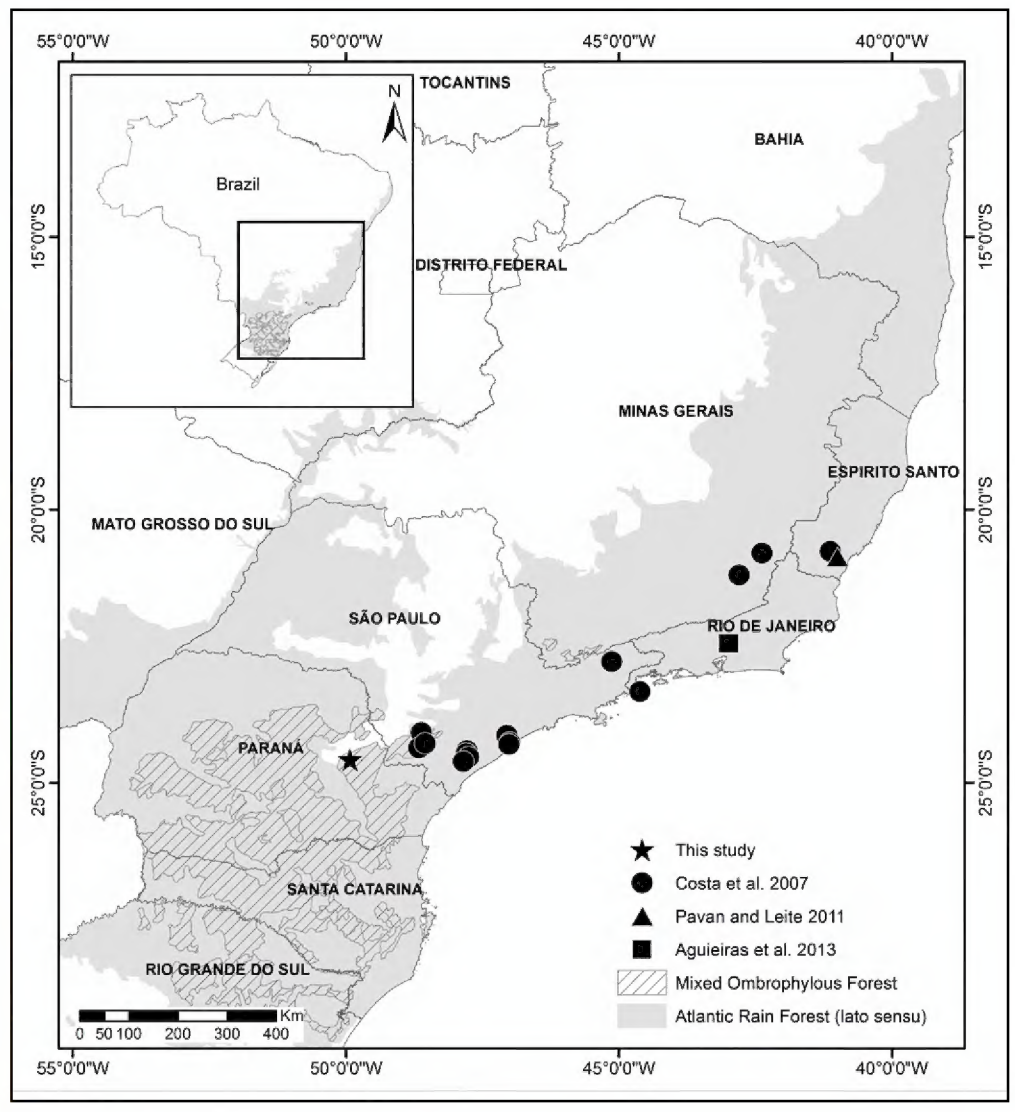

Figure 2. Map of the known distribution of *Juliomys ossitenuis* in Brazil, in Atlantic Forest biome, and in Mixed Ombrophilous Forest. The star indicates the Floresta Nacional de Piraí do Sul, Paraná state, where this study registered the species in November 2012 (MHNCI 6478).

effort of the campaign was 505 trap.nights for live traps, and 300 trap.nights for pitfall traps. In the same habitat and sampling campaign we also captured *Akodon montensis* (*n* = 10), *Brucepattersonius iheringi* (*n* = 2), *Didelphis aurita* (*n* = 1), *Oligoryzomys nigripes* (*n* = 5) and *Thaptomys nigrita* (*n* = 1). The individual was prepared as skin and skull (Table 2 for external and craniodental measurements and Figure 5 for skull picture). It was karyotyped (Figure 4) following the techniques proposed by Ford and Hamerton (1956), with modifications proposed by Sbalqueiro and Nascimento (1996). The skin, skull, tissue, and genetic material are housed at Museu de História Natural do Capão da Imbuia (MHNCI), Curitiba, Paraná, Brazil under collection number MHNCI 6478. The morphology of the specimen matches that described by Costa et al. (2007), including a small body size (177–213 mm), short soft pelage, a dark orangish dorsum, a cream-white belly with

Figure 3. Riparian forest where an adult, male, *Juliomys ossitenuis* (MHNCI 6478) was captured in Floresta Nacional de Piraí do Sul, Paraná State, Brazil.

Table 2. External and craniodental measurements (mm) and weight (g) of *Juliomys ossitenuis* specimen caught at Floresta Nacional de Piraí do Sul. Measurements from the holotype and paratypes were extracted from Costa et al. (2007) as well as the measures and their acronyms: TL=total length, TA=length of tail, HF=hind foot length, Ear=length of ear, ONL=occipto-nasal length, PL= palatal length, PPL= post-palatal length, MRC=molar row-crown length, M1B=first molar breadth, PBL=palatal bridge length, TFL= temporal fossa length, DL= diastema length, IFL=incisive foramen length, IFB= incisive foramen breadth, PB1= palatal breadth at first molar, PB3= palatal breadth at third molar, MFB= mesopterygoid fossa breadth, BIT= breadth across incisor tips, BW= bullar width, BL= bullar length, BCB= braincase breadth, SH=skull height, RH= rostral height, RB=rostral breadth, RL=rostral length, NL=nasal length, ZPL=zygomatic plate length, IOB=interorbital breadth, ZB=zygomatic breadth, GLM= greatest length of mandible, MMR= mandibular molar row-alveolar length, DR= depth of ramus).

	MHNCI 6478 (M)	MN 69752 Holotype (F)	MN 69753 Paratype (F)	UFMG 3173 Paratype (F)	UFMG 3174 Paratype (M)	MZUSP 33170 Paratype (F)	Mean
Age class	2	3	2	2	2	3	-
TL	183	205	190	213	165	177	189
TA	102	110	106	116	89	103	104
HF	18	21	21	22	14	19	19
Ear	14	16	14	17	14	10	14
Weight	18	22	18	28	11	14	19
ONL	23.84	25.74	—	26.83	21.95	23.95	24.46
PL	9.08	11.61	10.83	12.08	9.80	10.81	10.70
PPL	8.68	9.01	8.42	9.78	7.47	8.32	8.61
MRC	3.68	3.85	3.69	3.92	3.76	3.65	3.76
M1B	1.09	1.06	1.02	1.11	1.03	1.02	1.06
PBL	3.38	3.81	3.58	3.86	3.28	3.39	3.55
TFL	—	7.84	7.15	8.15	6.79	6.56	7.30
DL	6.16	6.57	6.08	7.04	5.47	6.01	6.22
IFL	4.25	4.85	4.67	5.36	4.19	4.72	4.67
IFB	1.59	1.78	1.86	2.13	1.69	1.34	1.73
PB1	2.66	2.57	2.53	2.65	2.33	2.31	2.51
PB3	2.44	2.86	2.87	3.12	2.69	2.63	2.77
MFB	—	1.86	1.67	1.95	1.43	1.72	1.73
BIT	1.38	1.65	1.49	1.76	1.31	1.57	1.53
BW	4.02	3.79	3.75	3.98	3.71	3.70	3.83
BL	4.12	4.78	4.56	4.91	4.62	4.48	4.58
BCB	10.80	10.12	10.13	10.49	10.15	10.34	10.34
SH	8.05	7.54	7.40	7.87	6.95	7.33	7.52
RH	4.05	4.68	4.42	5.16	3.99	4.22	4.42
RB	3.82	4.33	4.25	4.87	3.74	3.90	4.15
RL	6.91	7.90	—	8.34	6.35	7.42	7.38
NL	8.50	9.15	—	9.80	7.23	8.95	8.73
ZPL	1.97	1.77	1.64	2.20	1.34	1.66	1.76
IOB	3.96	3.63	3.57	3.70	3.69	3.87	3.74
ZB	12.52	13.27	12.74	13.98	11.97	12.19	12.78
GLM	11.25	13.37	12.57	14.01	11.76	12.51	12.58
MMR	3.83	3.95	3.77	3.98	3.77	3.72	3.84
DR	2.75	2.81	2.60	2.90	2.63	2.71	2.73

markedly orangish portions of the snout and haunches, a tail slightly longer than the body length (103–116 mm), and hind feet short (19–22 mm) and wide, covered with light orangish hairs. We documented 2n = 20 and FNa = 36 (15 cells counted), all the autosomals are bi-armed, varying between metacentric and submetacentric. The sexual pair has a metacentric X chromosome and a large acrocentric Y chromosome, as previously described by Costa et al. (2007).

This new record highlights the need for a greater inventory effort in inland areas, where less is known about the geographic distribution of small non-volant mammal taxa in the Neotropics. Inventories are especially high priority in the vegetation types associated with the Mixed Ombrophilous Forests of Brazil's Southern Plateau, whose original extension has been severely reduced due to a variety of historical anthropogenic impacts (Ribeiro *et al.* 2009). The record of *Juliomys ossitenuis* in Paraná state extends its distribution to southern Brazil and to Araucaria Forest, where it was not previously known to occur. It likewise highlights the important role played by protected areas, even small ones, in conserving small non-volant mammals.

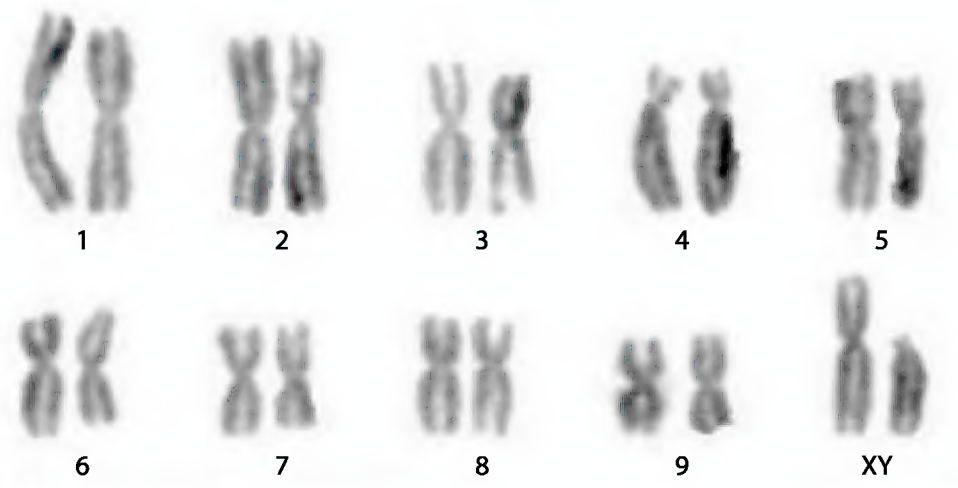

Figure 4. Karyotype of an adult, male, *Juliomys ossitenuis* (MHNCI 6478) caught in Floresta Nacional de Piraí do Sul, with 2n = 20, FNa = 36.

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Authors' contribution statement: GG, CMJR, HO, JSP, FGA and LMT collected the data, including taxidermy and skull cleaning, and took the pictures. GG, IH and IJS done the cytogenetic procedures. GG and LMT wrote the the text.

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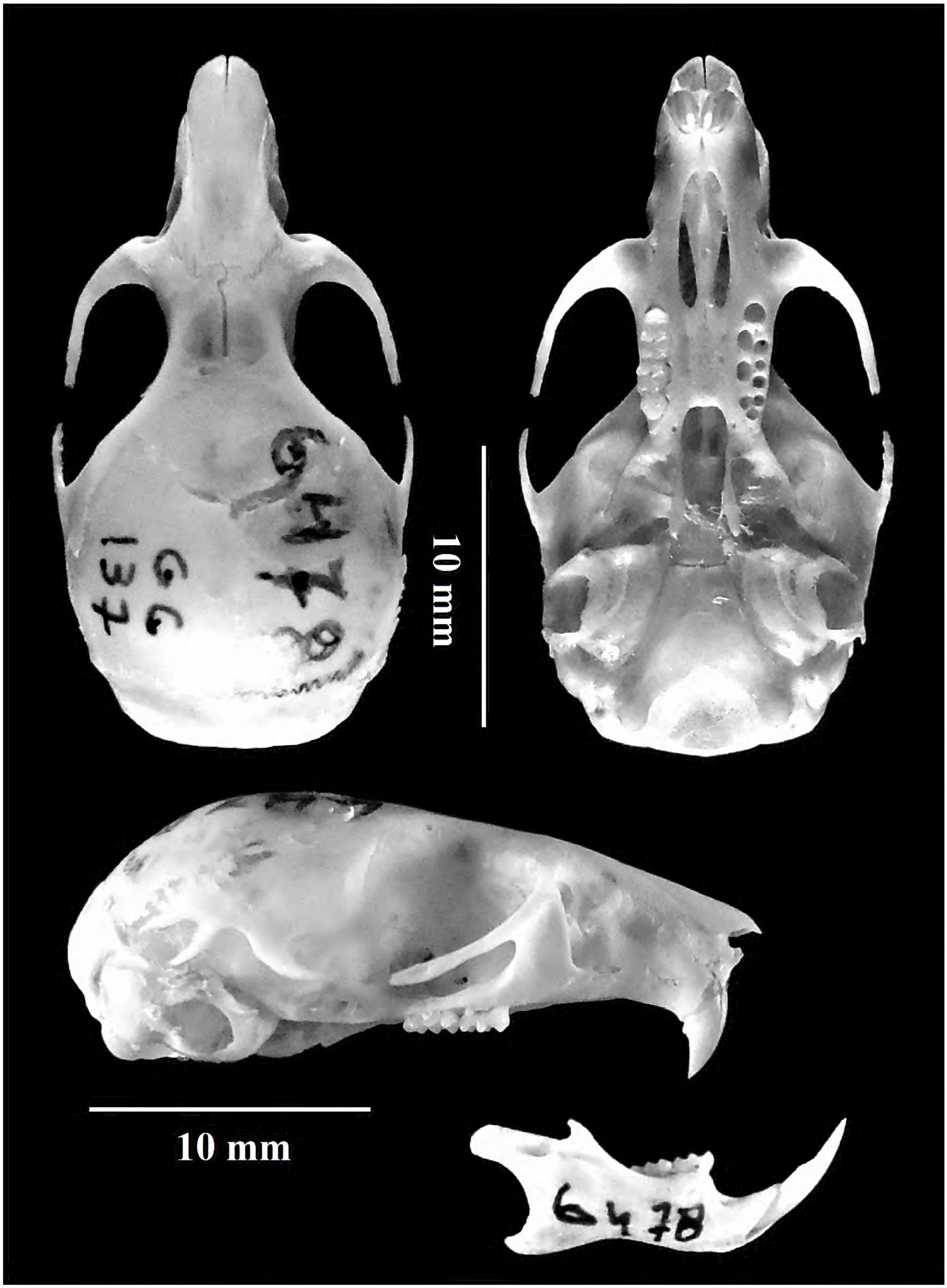

Figure 5. Dorsal, ventral and lateral views of skull and lateral view of the mandible of and adult, male, *Juliomys ossitenuis* (MHNCI 6478) from Floresta Nacional de Piraí do Sul, Paraná state, Brazil.